

## Accepted Manuscript

Suicidality in body dysmorphic disorder (BDD): A systematic review with meta-analysis

Ioannis Angelakis, Patricia A. Gooding, Maria Panagioti

PII: S0272-7358(15)30095-7

DOI: doi: [10.1016/j.cpr.2016.08.002](https://doi.org/10.1016/j.cpr.2016.08.002)

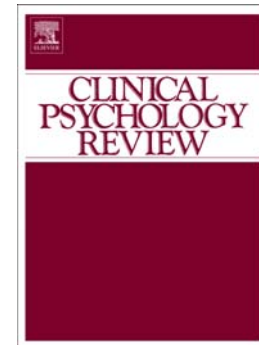
Reference: CPR 1538

To appear in: *Clinical Psychology Review*

Received date: 26 August 2015

Revised date: 26 July 2016

Accepted date: 18 August 2016



Please cite this article as: Angelakis, I., Gooding, P.A. & Panagioti, M., Suicidality in body dysmorphic disorder (BDD): A systematic review with meta-analysis, *Clinical Psychology Review* (2016), doi: [10.1016/j.cpr.2016.08.002](https://doi.org/10.1016/j.cpr.2016.08.002)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

## Suicidality in Body Dysmorphic Disorder (BDD): A systematic review with meta-analysis.

Body Dysmorphic Disorder (BDD) is a serious, incapacitating mental health condition characterized by a series of symptoms related to body image concerns, such as recurrent intrusive thoughts about perceived deformations or flaws in physical appearance (American Psychiatric Association, 2013). The prevalence of BDD is estimated to be about 2% in the general population (Buhlmann et al., 2010; Koran, Abujaoude, Large, Serpe, 2008), whereas in people seeking cosmetic surgery a BDD rate of 15.6% have been reported (Buhlmann et al., 2010). Although more common than other severe mental health conditions, such as schizophrenia and anorexia nervosa that range in prevalence from 0.5 to 1% in the general population (Hoek & Hoeken, 2003; Saha, Chant, Welham, & McGrath, 2005), BDD remains often unrecognized in clinical practice and its association with other serious mental health adversities, including suicidal ideation and suicide attempts has received scant research attention (Veale & Bewley, 2015). In this study the term suicidality was used to refer to suicidal ideation, plans and attempts and suicide deaths. It should be noted that in psychiatric inpatient settings, BDD is rarely identified unless a structured diagnostic interview is used (Grant, Kim, & Crow, 2001; Conroy, Menard, Fleming-Ives, Modha, Cerullo, & Phillips, 2008; Veale, Akyuz, & Hodsoll, 2015). This has the consequence of under-estimating the number of patients with BDD, who are usually misdiagnosed as having depression, as well as the rates of suicide risk in people with BDD.

BDD is classified under the category of obsessive-compulsive and related disorders in DSM-5, whereas in previous versions of DSM it was included in the category of somatoform disorders (APA, 2000, 2013). This shift in the conceptualization of BDD is consistent with the scientific literature showing that BDD and Obsessive Compulsive Disorder (OCD) are distinct, but closely related, and often comorbid, mental illnesses (Frare, Perugi, Ruffolo, & Toni, 2004; Phillips, Pinto, Menard, Eisen, Mancebo, & Rasmussen, 2007). A recent

systematic review and meta-analysis confirmed that there is a strong relationship between OCD and suicidality (Angelakis, Gooding, Tarrier, & Panagioti, 2015). Considering, therefore, the commonalities between BDD and OCD, which are accompanied by similar levels of functional impairment, we anticipated that suicidality also is manifest in people experiencing BDD. Consistent with this view, a number of studies have shown that patients with BDD are at particularly high risk of experiencing suicidality (e.g., Phillips, 2007; Philips, Coles, Menard, Yen, Fay, & Weisberg, 2005). For example, prevalence estimates of suicide attempts in people with BDD has been reported as 7.2% (Rief, Buhlmann, Wilhelm, Borkenhagen, & Brähler, 2006). The prevalence of such attempts in the general population has been documented as 2.7% world-wide (Nock et al., 2008), and in those with anxiety disorders and schizophrenia spectrum disorders as 3.4% and 10.9% respectively (Barak, Baruch, Achiron, & Aizenberg, 2008; Nepon, Belik, Bolton, & Sareen, 2010).

Despite people with BDD being at high risk of engaging in suicide attempts, understanding the links between the severity and type of BDD symptoms and the development and maintenance of suicidality is under-researched in the extant literature. BDD is accompanied by high levels of psychological distress, hopelessness, and feelings of embarrassment, shame, or discomfort related to appearance and body image (Phillips, 2000; Phillips, McElroy, Keck Jr., Pope Jr., & Hudson, 1993; Veale, Gournay, Dryden, Boocock, Shah, & Willson, 1996). As a consequence, people with BDD often feel socially anxious, and withdraw from, or avoid, social interactions (Hollander & Abronowitz, 1999; Veale & Roberts, 2014). Empirically based contemporary models of suicidality indicate that such negative feelings, experiences, and perceptions, especially when linked with social isolation, are risk factors for the triggering, and maintenance, of suicidal thoughts, behaviors, and acts (Johnson, Gooding, & Tarrier, 2008; O'Connor & Nock, 2014; Tarrier et al., 2013; Williams, 1997). Comorbid depressive symptoms also are common features of BDD (Phillips, Didie, & Menard, 2007) and may amplify relationships between the range of negative perceptions

associated with having BDD, resultant social isolation, and suicidality. To date, only one study (Witte, Didie, Menard, & Phillips 2012) attempted to investigate pathways to suicidality in people with BDD following a theoretical framework as postulated by the interpersonal-psychological theory of suicide (Joiner, 2005; Van Orden et al., 2010). Among the key variables that predicted suicide attempts in BDD patients as supported by the study's data were a diagnosis of PTSD, lifetime work impairment owing to BDD and lifetime BDD-related restrictive food intake. Major depressive disorder together with lifetime work impairment were found to be among the critical variables that predicted suicidal ideation in BDD.

In the absence of a systematic review, however, it is difficult to ascertain the levels of, and the mechanisms underlying suicidality in those experiencing BDD. Therefore, we decided to undertake a systematic review and meta-analysis with the following three core objectives:

- i. To systematically synthesize and quantify any association between BDD and suicidality.
- ii. To examine the underlying mechanisms of suicidality in BDD, which are likely to include specific features of BDD (e.g., severity, specific symptoms or sub-types), psychiatric comorbidities (e.g., depression, OCD) and other clinical, psychological or demographic factors.
- iii. To examine whether the co-presentation of OCD and BDD further escalates the risk for suicidality over and above the effects of OCD and BDD alone.

## 2. Methods

This systematic review and meta-analysis was performed and presented in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Moher, Liberati, Tetzlaff, & Altman, 2009).

### 2.1. Eligibility criteria

The identified studies had to meet three criteria to be included in the review:

- a) applied a quantitative research design (e.g., cross-sectional, prospective),
- b) investigated the relationship between suicidality and a diagnosis of BDD, or explored any factors that contributed to this relationship,
- c) was written in English and published in a peer-reviewed journal.

Since this is the first systematic review in the field, we decided to adopt an inclusive approach and not to add any participant age limit. However, we anticipated that the vast majority of the eligible studies would recruit adults. Case studies, qualitative studies and non-empirical studies and reviews were excluded from this systematic review.

## 2.2. Search strategy and data sources

Five electronic bibliographic databases were searched which were Medline, PsychInfo, Embase, Web of Science, and CINAHL. We also identified eligible studies by checking the reference lists of the identified studies. Searches were conducted from inception to June 2015. Our search strategy included both text words and MeSH terms (Medical Subjective Headings) and combined two key blocks of key-terms: suicide (suicid\* OR self\*harm<sup>1</sup>) and BDD (body dysmorphic disorder OR BDD).

## 2.3. Study selection

Co-authors IA and MP independently screened the titles and abstracts of the research papers that were initially identified. The full text of the studies, which met the eligibility criteria, were accessed and screened again and independently by the two reviewers. Inter-rater reliability was high, kappa = 0.96. Disagreements were resolved through discussions.

---

<sup>1</sup> The focus of this review was on suicidality. Self-harm was included in the search terms to maximize the sensitivity of the searches. Although some studies might refer to self-harm, they actually include validated measures of suicidal thoughts and behaviors.

#### 2.4. Data extraction

An electronic data extraction form was developed and initially piloted with five randomly selected studies. Descriptive and quantitative data were extracted independently by two co-authors (IA and MP). Descriptive information included participant characteristics (i.e., age, gender, diagnoses), study characteristics (i.e., country, design, method of recruitment), BDD outcomes (i.e., screening/diagnostic tools for BDD), suicidality outcomes (i.e., screening tools for suicidality), and mode of suicidality (i.e., suicidal ideation, suicide attempts, plans, suicide deaths). Data were also extracted pertaining to the association between BDD and suicidality and the factors that underlie the BDD-suicide relationship. Co-authors IA and MP carried out data extraction independently. The inter-rater reliability was high ( $\kappa = 0.93$ ) and based on the 655 data points examined.

#### 2.5. Appraisal of methodological quality

The appraisal of the methodological quality of the studies was performed using six criteria adapted from the Centre for Reviews and Dissemination guidance for undertaking reviews in health care (CRD, 2009) and the Quality Assessment Tool for Quantitative Studies (Thomas, Ciliska, Dobbins, & Micucci, 2004). These criteria were: i) research design (cross sectional = 0, prospective/experimental = 1), ii) baseline participants' response rate (>70% or not reported = 0, <70% = 1), iii) follow-up participants' response rate (>70% or not reported = 0, <70% = 1), iv) measure of BDD (self-report scale/not reported = 0, structured/semi-structured clinical interview = 1), v) measure for suicidality (not reported/other = 0, structured/semi-structured clinical interview/self-report scale = 1), and vi) control for confounding/other factors in the analysis (no controlled/not reported = 0, controlled = 1).

#### 2.6. Data analysis

The results of the individual studies measuring the relationship between suicidality and BDD were pooled using meta-analytic analysis techniques. Odds ratios (ORs) and associated Confidence Intervals (CI) for the outcome measures of these studies were calculated using STATA 12.1 (Stata, 2011). ORs were the preferred pooled effect size because the vast majority of studies reported categorical outcomes, such as numbers/proportions of participants with or without BDD who evidenced suicidal ideation and attempts. Only one study reported a continuous outcome (mean number of suicide attempts in participants with BDD and without BDD) (Grant, Kim, & Crow, 2001), which was converted to OR based on the commonly used formula suggested by Borenstein, Hedges, Higgins, & Rothstein (2005). The pooled ORs in addition to the forest plots were computed using the *meta-an* command in STATA (Kontopantelis & Reeves, 2010). We only performed one subgroup analysis to examine whether the results of the association between BDD and suicidality varied across different types studies (studies based on clinical populations and large community surveys) and one sensitivity analysis to examine whether the results of the main analysis pertained when only studies with sound methodological properties were retained. All analyses were conducted using a random effects model because of anticipated heterogeneity. Heterogeneity was assessed using the  $I^2$  statistic (Higgins, Thompson, Deeks, Altman, 2003). We also examined whether publication bias was present by inspecting the funnel plot and examining the significance of the Egger's test (Egger, Smith, Schneider, Minder, 1997).

Only a small proportion of studies examined the potential mechanisms underlying suicidality in BDD. All the available quantitative data addressing mechanisms of suicidality in BDD were converted to ORs to facilitate comparability, but meta-analysis was only used when pooling the data was appropriate. Instead, a narrative synthesis of the results was performed when data could not be pooled.

### 3. Results

The search strategy yielded 325 articles. Of these, 51 were relevant for full-text screening. As shown in the flowchart (Fig. 1), 37 studies were eligible to be included in the review, but 18 were based on the same sample of participants (see Appendix 1). Among these 18 studies, only one study (which provided the most complete data) was entered in the meta-analysis. Therefore, this review comprised 20 independent studies.

#### 3.1. Descriptive characteristics of the studies

Table 1 presents the characteristics of the 20 studies that were included in the review. Of these, ten were conducted in the US (50%), eight in Europe (40%) and two in Brazil (10%). All studies included participants of both sexes, but the majority of studies included a higher proportion of women. The mean age of the participants was 38 ( $SD = 10.96$ ) with a range of 26.6 to 51 years. Two studies were conducted with children and adolescents with a mean age of 14.85 years ( $SD = 0.07$ ).

As shown in Table 1, with the exception of two studies (which were based on either DSM-III-R or DSM-V), a BDD diagnosis and the assessment of the severity of BDD symptoms was based on DSM-IV criteria. A wide range of diagnostic tools for BDD was employed by different studies. Fifteen studies employed clinical interviews to assign a diagnosis of BDD, whereas five studies used validated self-report questionnaires. The most common assessment measures were the structured clinical interview for DSM-IV (SCID; First, Spitzer, Gibbon, & Williams, 2002) and the Body Dysmorphic Disorder Questionnaire (BDD-Q; Phillips, 1998).

Seven studies provided data for suicidal ideation and suicide attempts, four studies measured suicidal ideation alone and two studies focused on suicide attempts alone. One study reported an aggregated score of suicidality. Suicidality was predominately determined using questions within the context of clinical interviews ( $n$



= 7) and self-report questionnaires ( $n = 7$ ). However, only three studies used validated questionnaires specifically designed to measure suicidality. Moreover, six studies failed to specify the measure used to assess suicidality. Only one study examined the link between BDD and suicide deaths.

### *3.2. Rates of suicidality in BDD*

The rates of suicidal ideation in individuals with BDD ranged from 17% to 77.2% (weighted pooled rate = 0.53, 95% CI = 0.39 to 0.66), whereas the rates of suicide attempts ranged from 2.6% to 62.5% (weighted pooled rate = 0.24, 95% CI = 0.16 to 0.35) (see Table 1). Six studies also examined the rates of suicidal ideation and suicide attempts attributed exclusively to BDD. BDD-induced suicidal ideation ranged from 19.1% to 69.7% (weighted pooled rate = 0.52, 95% CI = 0.36 to 0.67) and BDD-induced suicide attempts ranged from 1.5% to 22.2% (weighted mean rate = 0.12, 95% CI = 0.07 to 0.21). The high variability in the reported rates of suicidal ideation and attempts is probably due to large variations across studies including differences in sample sizes, measures used to assess suicidality, and participant recruitment strategies/settings. Finally, information about suicide deaths was scarce. Only one study reported that two participants died by suicide from a sample of 185 participants with BDD (Phillips & Menard, 2006).

### *3.3. Meta-analysis of the relationship between BDD and suicidality*

Fourteen studies provided data concerning the link between BDD and suicidality that were also amenable for meta-analysis. The remaining six studies focused on examining potential mechanisms underlying suicidality in BDD, or they did not provide sufficient information to allow computation of an effect size regarding the link between suicidality and BDD. None of the studies included amenable data with respect to the association between BDD and suicide deaths. Only data on suicide attempts were entered in the main analysis for

studies reporting data for both suicidal ideation and suicide attempts because the latter is more proximal to suicide deaths.

### 3.3.1. Main analyses

The pooled effect size across 14 relevant comparisons was statistically significant and positive, but high heterogeneity was present (OR = 3.35, 95% CI = 2.23 to 4.47,  $I^2 = 69.5\%$ ,  $p < 0.001$ , see Fig. 2). These results indicate that individuals with BDD were four times more likely to exhibit elevated rates of suicidality compared to individuals without BDD (including healthy controls and individuals diagnosed with eating disorders, OCD or any other anxiety disorder). Across these 14 comparisons, only one reported ORs lower than 1 indicating that levels of suicidality were lower in individuals with BDD compared to the control group, but this effect was statistically non-significant.

When examining suicidal ideation and suicide attempts in those with and without BDD (e.g., healthy controls, individuals diagnosed with eating disorders, OCD or any other anxiety disorder), those with BDD were four times more likely to have experienced suicidal ideation (pooled OR = 3.87, 95% CI = 2.32 to 5.32,  $I^2 = 68.6\%$ ,  $p < 0.01$ , see Fig. 3) and 2.6 times more likely to have made suicide attempts (pooled OR = 2.57, 95% CI = 1.44 to 3.69,  $I^2 = 65.4\%$ ,  $p < 0.01$ , see Fig. 3). However, the heterogeneity was high in studies examining both suicidal ideation and suicide attempts analyses.

### 3.3.2. Subgroup analysis

This analysis focused on the link between BDD and suicidality across studies based on clinical populations and large community surveys based on non-clinical populations. Across studies based on clinical populations, those with BDD were over 2 times more likely to have experienced suicidality compared to those without BDD (e.g. typically psychiatric patients diagnosed with a range of other diagnoses in addition to BDD such as eating disorders, OCD or any other anxiety disorders) (pooled OR = 2.44, 95% CI = 1.37 to 3.51,  $I^2 = 58.9\%$ ,  $p <$

0.01; Fig. 4). Across community surveys, those with BDD were almost 6 times more likely to have experienced suicidality compared to those without BDD (mostly healthy controls) (pooled OR = 5.70, 95% CI = 2.49 to 8.91,  $I^2 = 71.4\%$ ,  $p < 0.05$ ; Fig. 4).

### 3.3.3. Sensitivity analysis

The methodological quality of the studies was medium to high (see Table 2). Of the 14 studies analyzed, seven met three or four of the quality criteria. The pooled effect size of these seven studies (pooled OR = 3.35, 95% CI = 2.26 to 4.43,  $I^2 = 90.3\%$ ,  $p < 0.001$ ) was similar to the pooled effect size found in the main analysis of all 14 studies indicating that these results were not influenced by the methodological quality ratings.

### 3.3.4. Publication bias

No funnel plot asymmetry was observed suggesting that publication bias was not a problem in the current review. Consistent with this, the Egger test was non-significant for studies examining the association between BDD and suicidality (regression intercept = -0.58, SE = 1.78,  $p = 0.312$  see Fig. 5).

## 3.4. Mechanisms of suicidality in BDD

In this section we outline factors, which are likely to act as mechanisms underlying suicidality in BDD, mainly narratively but where possible using meta-analysis.

### 3.4.1. BDD-specific mechanisms

There was some evidence that BDD specific factors contributed to suicidality in BDD patients. The study by Phillips et al. (2005) demonstrated that BDD was the primary reason for suicidal ideation and suicide attempts across 70% of those diagnosed with BDD who reported suicidal ideation and across 50% who had previously made suicide attempts. Most importantly, individuals with BDD were highly likely to experience suicidal ideation (mean

rate of 46%) and suicide attempts (mean rate of 18%) attributed exclusively to BDD symptoms, such as, body image concerns.

Consistent with this, the pooled ORs showed that those with BDD were at a disproportionally higher risk for both suicidal ideation (pooled OR = 5.11, 95% CI = 3.48 to 6.74,  $I^2 = 93.1\%$ ,  $p < 0.001$ ) and suicide attempts (pooled OR = 6.24, 95% CI = 2.35 to 10.12,  $I^2 = 90.0\%$ ,  $p < 0.001$ ) induced by body image concerns compared to those without a BDD diagnosis (Buhlmann et al., 2010; Phillips, 1998; Rief et al., 2006).

Certain characteristics of BDD, including delusional (OR = 2.07, 95% CI = 1.38 to 4.08), weight concerns (OR = 2.26, 95% CI = 1.17 to 4.36), and muscle dysmorphia concerns (OR = 5.12, 95% CI = 2.37 to 9.21) were at heightened risk for suicide attempts (Phillips et al., 2005). Lifetime functioning impairment due to BDD was found to be an independent predictor of both suicide attempts BDD (OR = 1.59, 95% CI = 1.15 to 2.19) and suicidal ideation in BDD (OR = 1.48, 95% CI = 1.14 to 1.91), whilst controlling for several factors (including comorbidities) using multivariate regression analyses (Phillips et al., 2005).

### 3.4.2. Comparison of BDD and OCD

We identified five studies, which examined the effects of BDD and OCD on suicidality, but only two of these focused on comorbid BDD and OCD (Conceicao Costa et al., 2012; Frare et al., 2004). These two studies demonstrated that individuals with comorbid BDD and OCD had an increased risk for suicidality over and above OCD (suicidal ideation: pooled OR = 1.87, 95% CI = 1.15 to 2.60-  $I^2 = 0\%$ ,  $p = 0.82$ ; suicide attempts: OR = 2.78, 95% CI = 1.66 to 4.65). Studies comparing the levels of suicidality between two distinct groups of OCD and BDD patients showed that suicidal ideation was significantly higher in BDD groups compared to OCD groups (pooled OR = 2.15, 95% CI = 1.02 to 3.28,  $I^2 = 0\%$ ,  $p = 0.73$ ) but no difference was observed in the rates of suicide attempts (pooled OR = 0.72, 95% CI = 0.35 to 1.08,  $I^2 = 0\%$ ,  $p = 0.45$ ) (Phillips 2008; Phillips et al., 2007b; Weingarden et al., 2016).

### 3.4.3. Other psychiatric comorbidities

In addition to *OCD*, Phillips and co-workers (2005) showed that a range of comorbid psychiatric diagnoses were likely to be implicated in the underlying pathways to suicidality in BDD, such as, depressive disorders, eating disorders (i.e., anorexia nervosa or weight concerns), substance use disorders, posttraumatic stress disorder and personality disorders. Among these, comorbid major depression was found to be the strongest predictor of suicidal ideation in BDD (OR = 3.02, 95% CI = 1.30 to 6.99), whereas comorbid posttraumatic stress disorder (OR = 6.44, 95% CI = 1.54 to 26.93), and substance use disorders (OR = 3.07, 95% CI = 1.29 to 7.29), were the strongest predictors of suicide attempts in BDD. Two additional studies reported substantially increased risk for suicide attempts in BDD in the presence of comorbid anorexia nervosa (OR = 6.67, 95% CI = 1.63 to 27.27) (Grant et al., 2002) and substance use disorders (OR = 2.67, 95% CI = 1.35 to 5.30) (Grant et al., 2005).

### 3.4.4. Socio-demographic factors

Two studies, including three independent samples (Bjornsson et al., 2013; Phillips et al., 2005), consistently found that BDD was associated with a 2.4-fold increase in suicide attempts (pooled OR = 2.36, 95% CI = 1.24 to 3.48,  $I^2 = 0\%$ ,  $p = 0.84$ ), if the onset of BDD symptoms occurred in childhood or adolescence as opposed to adulthood. However, no such differences were found with respect to suicidal ideation (pooled OR = 1.28, 95% CI = 0.69 to 1.86,  $I^2 = 0\%$ ,  $p = 0.66$ ). Phillips et al. (2005) found no differences for other demographics, such as, gender (OR = 0.98, 95% CI = 0.40 to 2.01) or marital status (OR = 1.09, 95% CI = 0.73 to 1.20) between BDD individuals who experienced suicidality and those who did not experience suicidality.

## 4. Discussion

### 4.1. Summary of main findings

The first aim of this systematic review and meta-analysis was to investigate the associations between BDD and suicidal thoughts, attempts and deaths. Our findings confirmed that suicidality in BDD is a substantial concern that has not received sufficient research attention. Individuals diagnosed with BDD were four times more likely to experience suicidal ideation and 2.6 times more likely to engage in suicide attempts compared to individuals without BDD. These estimates are at least as high as those found in other anxiety disorders (OR = 2.89 95% CI = 2.09 to 4.00 for suicidal ideation and OR = 2.47, 95% CI = 1.96 to 3.15 for suicide attempts; Kanwar et al., 2013) and comparable with severe psychiatric morbidities such as PTSD and major depression (ORs ranging from 4.8 to 5.7 for suicide attempts without controlling for other psychiatric comorbidities and 2.0 to 2.3 controlling for comorbidities) (Nock et al., 2010).

With regard to suicide deaths, the Centers for Disease Control and Prevention reported a suicide death rate of 12.6% per 100,000 citizens in the USA (CDC, 2014). In this review, we only found one longitudinal study which reported that two out of 185 individuals with BDD died by suicide in a period of one year (Phillips & Menard, 2006). However, this study utilized a very small number of participants and had a brief follow-up period. Its direct comparison therefore with large national studies with extensive follow-up periods or psychological autopsy studies is not legitimate. Indeed, there is evidence that short-term longitudinal studies in other high risk populations such as schizophrenia and major depression found similar findings. A suicide death rate of 2.2% has been reported for patients with schizophrenia within a year (Limosin, Loze, Phillipe, Casadebaig, & Rouillon (2007), and 1% for patients with major depression within a 18 month-period (Sokero, Melartin, Rytsala, Leskela, Lestela-Mielonen, & Isometsa, 2005).

In order to investigate suicidality in people experiencing BDD it is, perhaps, necessary to take a mixed methods approach given that it is difficult to detect BDD, and that death by suicide is rare. For example, an inclusive diagnostic approach to BDD could be taken, with

qualitative and quantitative techniques used to explore distal and proximal risk factors for suicidal thoughts and attempts. A novel way forward in this endeavor would be to examine not only "risk factors" for suicidality but also the factors which have allowed people with BDD to become resilient to suicidal thoughts and behaviors (Johnson et al., 2010).

Furthermore, the application of the Integrated Motivational Volitional Model of Suicide (O'Connor, 2011) to understanding transitions from suicidal thoughts and plans to suicidal acts seems particularly germane to links experiencing BDD and the development of suicidal thoughts and acts.

The second aim of this meta-analysis was to investigate the mechanisms underlying the relationship between BDD and suicidality with a focus on specific characteristics of BDD related to body image and appearance, co-morbid mental illnesses, and other clinical, psychological or demographic factors including social isolation or withdrawal. No evidence was available in the literature regarding the mechanisms underlying suicidality in BDD, with the exception of only one study that examined the relationship between BDD and the acquired capability for suicide by following the interpersonal-psychological theory of suicide (Witte et al., 2012). This study suggested that PTSD, major depressive disorder, lifetime work impairment owing to BDD and lifetime BDD-related restrictive food intake were among the key variables accounting for suicidality in BDD patients. This finding is in accord with other studies showing that the risk of suicidality is amplified by an increase in the number of mental illnesses experienced (Arsenault-Lapierre et al., 2004; Nock, Hang, Sampson, Kessler, 2010).

It was notable that no study to date sought to examine mediational pathways in which adverse experiences, negative perceptions and unpleasant emotions arising from having BDD led to suicidal thoughts and acts both directly, and also indirectly via increased social anxiety and social withdrawal. These sort of pathways are postulated by models of suicidal thoughts and behaviors which can include the influence of diagnosis specific factors, including co-

morbid illnesses, such as depression (Johnson et al., 2008; O'Connor & Nock, 2014; Van Orden et al., 2010).

The third aim of this meta-analysis was to determine the extent to which a co-morbid presentation of OCD and BDD increased the probability of suicidality compared to either OCD or BDD alone. It was found that BDD amplified suicidality above the effects of OCD. That said, this finding was based on only two papers which tempers conclusions (Conceicao Costa et al., 2012; Frare et al., 2004).

#### *4.2. Key research inferences and future directions*

Two key research inferences can be drawn from this systematic review and meta-analysis. First, evidence was obtained that BDD groups exhibited significantly higher levels of suicidality compared to other psychiatric groups that have been established as at high-risk for suicidal thoughts and acts in the literature (Kosto, Lerman, & Attia, 2014; Novick, Swartz, & Frank, 2010). In particular, the majority of the control groups recruited in the studies included in this meta-analysis comprised individuals diagnosed with other severe mental illnesses (i.e., eating disorders, OCD, bipolar disorder) (Grant et al., 2001; Grant et al., 2002; Frare et al., 2004; Zimmerman et al., 1998). Despite this, suicidality rates in BDD groups exceeded suicidality rates in by 2.6 times compared to clinical controls and almost 6 times compared to non-clinical control. Taken together, these findings indicate that the levels of suicidality in BDD were worryingly high and that there is a need to produce higher-quality evidence to understand the mechanisms underlying BDD. With a clearer understanding of these underlying mechanisms it is then possible to develop psychological interventions which can ameliorate suicidal thoughts and behaviors in people with BDD (Tarrier et al., 2013).

Second, initial evidence was obtained that a BDD diagnosis per se or specific BDD symptoms, including distorted body image concerns and functional impairments related to BDD, were strong predictors of suicidality. This finding is consistent with the evidence



showing that BDD is associated with high levels of depression, psychological distress and disability (Veale & Bewley, 2015). However, the degree to which BDD-specific factors lead to suicidality without the synergy of psychological and comorbidity factors is currently uncertain. This uncertainty derives from the lack of investigations examining pathways to suicidality which include hypothesized mediators (e.g., defeat, entrapment, hopelessness) and moderators (e.g., specific symptoms of BDD such as body image concerns, and symptoms of comorbid mental illnesses, such as depression). Clearly, it is important to further develop contemporary models of suicidal thoughts, feelings, and acts so that they apply to people who experience BDD. Three such models have identified perceptions of defeat, entrapment and hopelessness as being important in the pathways to suicidality across people experiencing a range of mental illnesses (Johnson et al., 2010; O'Connor & Nock, 2014; Tarrier et al., 2013; Williams, 1997). It will be important for future work to examine the roles of defeat and entrapment in relation to suicidality in BDD in addition to examining the impact of psychosocial factors, such as social isolation, social withdrawal and feelings of being a burden (Joiner et al., 2009).

#### *4.3. Strengths and limitations*

This study has a number of strengths. First, it is the first systematic review to provide a comprehensive synthesis of the association between BDD and suicidality. Second, this review was performed and reported according to PRISMA guidance (e.g., Liberati et al., 2009). Third, the literature search criteria were designed to be comprehensive and the eligibility criteria were broad to ensure that we incorporated all the evidence in the area. Fourth, two independent researchers were involved in all data screening and extraction, and reliability tests were performed, which indicated high levels of inter-rater agreement.

This review also has important limitations. The number of studies included in this review was modest and comprised heterogeneous populations and outcomes (i.e., different

forms of suicidality were assessed with a wide range of tools). We endeavored to account for the large heterogeneity by applying random effect models to adjust for between-study variations. However, we only explored the impact of basic sources of heterogeneity (e.g., different types of suicidality), because multiple subgroup analyses inflate the probability of finding false-positive results (Ioannidis, Patsopoulos, & Rothstein, 2008).

There is an argument that meta-analysis is inappropriate in the context of high levels of clinical, methodological and statistical heterogeneity, and the data may be more suited to a narrative synthesis (Ioannidis, Patsopoulos, & Rothstein, 2008). However, such syntheses are difficult to interpret. We adopted meta-analysis to allow us to compare results across studies, to examine the consistency of effects, and to explore variables that might account for inconsistency (Kontopantelis, Springate, Reeves, 2013).

Although the assessment of the methodological quality of the studies was not comprehensive, the selected criteria reflect all the key quality aspects of observational studies. However, the design of the included studies was mostly cross-sectional, which imposes limits on our ability to establish causal links between suicidality and BDD and the mechanisms that underpin these links.

Finally, in this study we combined data derived from psychiatric patients and those from the general population. This, potentially, could have inflated the rates of suicidality, since people diagnosed with mental illnesses tend to engage more often in suicide behaviors compared to healthy controls (e.g., Harris & Barraclough, 1997). In addition, the sample sizes of the patient population combined in this review were significantly smaller than those coming from the general community.

#### *4.4. Clinical implications and conclusions*

These findings indicate that suicidality could be a major concern among people presenting with BDD symptoms in clinical settings. At present, the lack of awareness about

the risk for suicidality in BDD suggests that these patients might not be appropriately assessed for suicide risk. Patients that should be primarily diagnosed with BDD go either misdiagnosed as having depression or undiagnosed (Conroy et al., 2008; Veale, Akyuz, & Hodsoll, 2015), which leads to an underestimation of suicide risk in BDD. Until now, no efforts have been made to therapeutically target suicidality in those with BDD. For instance, protocols of psychological therapies, which aim to treat BDD, often exclude patients who are actively suicidal (Wilhelm et al., 2011). Although, it is understandable that people with BDD, who also experience suicidality, are a particularly challenging population, it is very important not to exclude patients with the greatest need for interventions from accessing them.

This is the first systematic review and meta-analysis of the association between suicidality and BDD. Although the patterns within this association are complex, BDD was strongly associated with suicidality.

## References

- Angelakis, I., Gooding, P., Tarrier, N., & Panagioti, M. (2015). Suicidality in Obsessive compulsive disorder (OCD): A systematic review and meta-analysis. *Clinical Psychology Review, 39*, 1-15.
- Albertini R. S., & Phillips, K. A. (1999). Thirty-three cases of body dysmorphic disorder in children and adolescents. *Journal of American Academy Child Adolescent Psychiatry, 38*, 453-459.
- Altamura, C., Paluello, M. M., Mundo, E., Medda, S., & Mannu, P. (2001). Clinical and subclinical body dysmorphic disorder. *European Archives of Psychiatry and Clinical Neuroscience, 251*, 105-108.
- American Psychiatric Association (2004). *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR)*. Washington, DC: American

Psychiatric Association.

American Psychiatric Association (2013). *Diagnostic and Statistical Manual of Mental*

*Disorders, Fifth Edition (DSM-V)*. Washington DC: American Psychiatric Association.

Arsenault-Lapierre, G., Kim, C., & Turecki, G. (2004). Psychiatric diagnoses in 3275

suicides: A meta-analysis. *BMC*, 4, 37-47.

Barak, Y., Baruch, Y., Achiron, A., & Aizenberg, D. (2008). Suicide attempts in schizophrenia

patients: A case-controlled study in tertiary care. *Journal of Psychiatry Research*, 42,

822-826.

Beautrais, A. L. (2001). Suicides and serious suicide attempts: Two populations or one?

*Psychological Medicine*, 31, 837-845.

Beck, A. T., Brown, G., Berchick, R. J., Stewart, B. L., & Steer, R. A. (1990). Relationship

between hopelessness and ultimate suicide – A replication with psychiatric outpatients.

*American Journal of Psychiatry*, 147, 190-195.

Bjornsson, A. S., Didie, E. R., Grant, J. E., Menard, W., Stalker, E., & Phillips, K. A. (2013).

Age at onset and clinical correlates in body dysmorphic disorder. *Comprehensive*

*Psychiatry*, 54, 893-903.

Bolton, C., Gooding, P., Kapur, N., Barrowclough, C., & Tarrier, N. (2007). Developing

psychological perspectives of suicidal behaviour and risk in people with a diagnosis

with schizophrenia: We know they kill themselves but do we understand why? *Clinical*

*Psychology Review*, 27, 511-536.

Borenstein, M., Hedges, L., Higgins, J., & Rothstein, H. (2005). Comprehensive meta-

analysis. In (2.2.034 Ed.). Englewood, NJ: Biostat.

Buhlmann, U., Glaesmer, H., Mewes, R., Fama, J. M., Wilhelm, S., Brähler, E., & Rief, W.

(2010). Updates on the prevalence of body dysmorphic disorder: A population-based

survey. *Psychiatry Research*, 178, 171-175.

Centers for Disease Control and Prevention. (2014). Web-based Injury Statistics Query and

Reporting System (WISQARS): Data & statistics. Retrieved from

<http://www.cdc.gov/ncbddd/fasd/data.html>

- Conceicao Costa, D. L., Chagas Assuncao, M., Arzeno Ferrao, Y., ArchettiConrado, L., Hajaj Gonzalez, C., Franklin Fontenelle, L., et al. (2012). Body dysmorphic disorder in patients with obsessive-compulsive disorder: Prevalence and clinical correlates. *Depression and Anxiety*, 29, 966-975.
- Conroy, M., Menard, W., Fleming-Ives, K., Modha, P., Cerullo, H., & Phillips, K. A. (2008). Prevalence and clinical characteristics of body dysmorphic disorder in adult inpatient setting. *General Hospital Psychiatry*, 30, 67-72.
- Crerand C. E., Franklin, M. E., & Sarwer, D. B. (2006). Body dysmorphic disorder and cosmetic surgery. *Plastic and Reconstructive Surgery*, 118, 167-80.
- de Brito, M. J., Nahas, F. X., Cordas, T. A., Tavares, H. & Ferreira, L. M. (2015). Body dysmorphic disorder in patients seeking abdominoplasty, rhinoplasty, & rhytidectomy. *Plastic & Reconstructive Surgery*, 137, 462-471.
- Dyl, J., Kittler, J., Phillips, K. A., & Hunt, J. I. (2006). Body dysmorphic disorder and other clinically significant body image concerns in adolescent psychiatric inpatients: Prevalence and clinical characteristics. *Child Psychiatry and Human Development*, 36, 369-382.
- Egger, M., Smith, G. D., Schneider, M., & Minder, C. (1997). Bias in meta-analysis detected by a simple, graphical test. *British Medical Journal*, 315, 629-634.
- First, M. B., Spitzer, R. L., Gibbon, M., Williams, J. B. W. (2002). *Structured Clinical Interview for DSM-IV-TR Axis I Disorders, Research Version, Patient Edition. (SCID-I/P)*. New York: Biometrics Research: New York State Psychiatric Institute.
- Frare, F., Perugi, G., Ruffolo, G., & Toni, C. (2004). Obsessive-compulsive disorder and body dysmorphic disorder: A comparison of clinical features. *European*

*Psychiatry*, 19, 292-298.

- Grant, J. E., Kim, S. W., & Crow, S. J. (2001). Prevalence and clinical features of body dysmorphic disorder in adolescent and adult psychiatric inpatient. *Journal of Clinical Psychology*, 62, 517-522.
- Grant, J. E., Kim, S. W., & Eckert, E. D. (2002). Body dysmorphic disorder in patients with anorexia nervosa: prevalence, clinical features, and delusionality of body image. *International Journal of Eating Disorders*, 32, 291-300.
- Harris, E. C., & Barraclough, B. (1997). Suicide as an outcome for mental disorders: A meta-analysis. *British Journal of Psychiatry*, 170, 205-228.
- Hawton, K., Sutton, L., Haw, C., Sinclair, J., & Harriss, L. (2005). Suicide and attempted suicide in bipolar disorder: A systematic review of risk factors. *Journal of Clinical Psychiatry*, 66, 693-704.
- Higgins, J. P. T., Thompson, S. G., Deeks, J. J., & Altman, D. G. (2003). Measuring inconsistency in meta-analyses. *British Medical Journal*, 327, 557-560.
- Hoek, H. W., & Hoeken, D. (2003). Review of the prevalence and incidence of eating disorders. *International Journal of Eating Disorders*, 34, 383-396.
- Hollander, E., & Aronowitz, B. R. (1999). Comorbid social anxiety and body dysmorphic disorder: Managing the complicated patient. *Journal of Clinical Psychiatry*, 60, 27-31.
- Kittler, J. E., Menard, W., & Phillips, K. A. (2007). Weight concerns in individuals with body dysmorphic disorder. *Eating Behaviors*, 8, 115-120.
- Hollander, E., Neville, D., Frenkel, M., et al. (1992). Body dysmorphic disorder diagnostic issues and related disorders. *Psychosomatics*, 33, 156-165.
- Ioannidis, J. P., Patsopoulos, N. A., & Rothstein, H. R. (2008). Reasons or excuses for avoiding meta-analysis in forest plots. *British Medical Journal*, 336, 1413-1415.
- Johnson, J., Gooding, P., & Tarrier, N. (2008). Suicide risk in schizophrenia: explanatory models and clinical implications: The schematic appraisal model of suicide (SAMS).

*Psychology & Psychotherapy*, 81, 55-77.

Johnson, J., Gooding, P. A., Wood, A. M., Taylor, P. J., Pratt, D., & Tarrier, N. (2010).

Resilience to suicidal ideation in psychosis: Positive self-appraisals buffer the impact of hopelessness. *Behaviour Research & Therapy*, 48, 883-889.

Joiner, T. E. (2005). *Why people die by suicide*. Cambridge: Harvard University Press.

Joiner, T. E., Van Orden, K. A., Witte, T. K., Selby, E. A., Ribeiro, J. D., Lewis, R., et al.

(2009). Main predictions of the interpersonal-psychological theory of suicidal behavior: Empirical tests in two samples of young adults. *Journal of Abnormal Psychology*, 118, 634-646.

Kelly, M. M., Zhang, J., & Phillips, K. A. (2015). The prevalence of body dysmorphic disorder and its clinical correlates in a VA primary care behavioral health clinic.

*Psychiatry Research*, 228, 162-165.

Kontopantelis, E., & Reeves, D. (2010). Meta-an: Random effects meta-analysis. *The STATA Journal*, 10, 395-407.

Kontopantelis, E., Springate, D. A., Reeves, D. (2013). A re-analysis of the Cochrane Library data: The dangers of unobserved heterogeneity in meta-analyses. *Plos One*, 8, e69930.

Koran, L. M., Abujaoude, E., Large, M. D., & Serpe, R. T. (2008). The prevalence of body dysmorphic disorder in the United States adult population. *CNS Spectrums*, 13, 316-322.

Kosto, K., Lerman, J. B., Attia, E. (2014). The current status of suicide and self-harm in eating disorders: A narrative review. *Journal of Eating Disorders*, 2, 19-27.

Leiner, A.S., Compton, M.T., Houry, D., Kaslow, N.J. (2008). Intimate partner violence, psychological distress, and suicidality: A path model using data from African American women seeking care in an urban emergency department. *Journal of Family Violence*, 23, 473-481.

Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P., Ioannidis, J. P. A., Clarke,

- P. J., Kleijnen, J., & Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: Explanation and elaboration. *British Medical Journal*, 339, B2700.
- Limosin, F., Loze, J-V., Phillipe, A., Casadebaig, F., & Rouillon, F. (2007). Ten-year prospective follow-up study of the mortality by suicide in schizophrenic patients. *Schizophrenia Research*, 94, 23-28.
- Mazzoleni, F. (2002).The importance of recognizing body dysmorphic disorder in cosmetic surgery patients: Do our patients need a preoperative psychiatric evaluation? *European Journal of Plastic Surgery*, 25, 305- 308.
- Moher, D., Liberati, A., Tetzlaff, J., & Altman, D.G. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement, Vol. 339.
- Nepon, J., Belik, S., Bolton, J., & Sareen, J. (2010). The relationship between anxiety disorders and suicide attempts: Findings from the national epidemiologic survey on alcohol and related conditions. *Depression & anxiety*, 27, 791-798.
- Nock, M. K., Borges, G., Bromet, E. J., Alonso, J., Angermeyer, M., Beautrais, A., Bruffaerts, R., Chiu, W. T., de Girolamo, G., Gluzman, S., de Graaf, R., Gureje, O., Haro, J. M., Huang, Y., Karam, E., Kessler, R. C., Lepine, J. P., Levinson, D., Medina-Mora, M. E., Ono, Y., Posada-Villa, J., & Williams, D. (2008). Cross-national prevalence and risk factors for suicidal ideation, plans and attempts. *The British Journal of Psychiatry*, 192, 98-105.
- Nock, M. K., Hwang, I., & Kessler, R. C. (2010). Mental disorders, comorbidity, and suicidal behavior: Results from the national comorbidity survey replication. *Molecular Psychiatry*, 15, 868-876.
- Novick, D. M., Swartz, H. A., & Frank, E. (2010). Suicide attempts in bipolar I and bipolar II disorder: A review and meta-analysis of the evidence. *Bipolar Disorders*, 12, 1-9.



- O'Connor, R. C. (2011). The Integrated Motivational-Volitional model of suicidal behavior. *Crisis-the Journal of Crisis Intervention and Suicide Prevention*, 32, 295-298.
- O'Connor, R. C., & Nock, M. K. (2014). The psychology of suicidal behaviour. *Lancet Psychiatry*, 1(1), 73-85.
- Perugi, G., Giannotti, D., Frare, F., Di Vaio, S., Valori, E., Maggi, L., Cassano, G. B., & Akiskal, H. S. (1997). Prevalence, phenomenology and comorbidity of body dysmorphic disorder (dysmorphophobia) in a clinical population. *International Journal of Psychiatry in Clinical Practice*, 1, 77-82.
- Panagioti, M., Gooding, P., & Tarrier, N. (2009). Posttraumatic stress disorder and suicidal behavior: A narrative review. *Clinical Psychology Review*, 29, 471-482.
- Panagioti, M., Gooding, P., & Tarrier, N. (2012). A meta-analysis of the association between posttraumatic stress disorder and suicidality: The role of comorbid depression. *Comprehensive Psychiatry*, 53, 915-930.
- Panagioti, M., Gooding, P., & Tarrier, N. (2015). A prospective study of suicidal ideation in posttraumatic stress disorder: The role of perceptions of defeat and entrapment. *Journal of Clinical Psychology*, 71, 50-61.
- Phillips, K. (1998). *The Broken Mirror: Understanding and Treating Body Dysmorphic Disorder*. Oxford University Press, Oxford.
- Phillips, K. A. (2000). Quality of life for patients with body dysmorphic disorder. *Journal of Nervous & Mental Disease*, 188, 170-175.
- Phillips, K. A. (2007). Suicidality in body dysmorphic disorder. *Primary Psychiatry*, 14, 58-66.
- Phillips, K. A., Coles, M. E., Menard, W., Yen, S., Fay, C. & Weisberg, R. B. (2005). Suicidal ideation and suicidal attempts in body dysmorphic disorder. *Journal of Clinical Psychiatry*, 66, 717-725.
- Phillips, K. A., Didie, E. R., & Menard, W. (2007b). Clinical features and correlates of major

- depressive disorder in individuals with body dysmorphic disorder. *Journal of Affective Disorder*, 97, 129-135.
- Phillips, K.A., Didie, E. R., Menard, W., Pagano, M.E., Fay, C., Weisberg, R. B. (2006). Clinical features of body dysmorphic disorder in adolescents and adults. *Psychiatry Research*, 141, 305-314.
- Phillips, K. A., McElroy, S. L., Keck Jr., P.E., Pope Jr., H.G., & Hudson, J. I. (1993). Body dysmorphic disorder: 30 cases of imagined ugliness. *American Journal of Psychiatry*, 150, 302-308.
- Phillips, K. A., & Menard, W. (2006). Suicidality in body dysmorphic disorder: A prospective study. *American Journal of Psychiatry*, 163, 1280-1282.
- Rief, W., Buhlmann, U., Wilhelm, S., Borkenhagen, A., & Brähler, E. (2006). The prevalence of body dysmorphic disorder: a population-based survey. *Psychological Medicine*, 36, 877-885.
- Saha, S., Chant, D., Welham, J., & McGrath, J. (2005). A systematic review of the prevalence of schizophrenia. *PloS Medicine*, 2(5). 10.1371/journal.pmed.0020141
- Scieber, K., Kollei, I., de Zwaan, M., & Martin, A. (2015). Classification of body dysmorphic disorder - What is the advantage of the new DSM-5 criteria? *Journal of Psychosomatic Research*, 78, 223-227.
- Sokero, T. P., Melartin, T. K., Rytsala, H. J., Leskela, U. S., Lestela-Mielonen, P. S., & Isometsa, E. T. (2005). Prospective study of risk factors for attempted suicide among patients with DSM-IV major depressive disorder. *British Journal of Psychiatry*, 186, 314-318.
- Sonderman, J. S., Munro, H. M., Tarone, R. E., & McLaughlin, J. K. (2014). Suicides, homicides, accidents, and other external causes of death among blacks and whites in the Southern Community Cohort Study. *PloS ONE*, 9(12). doi:10.1371/journal.pone.0114852

- Tarrier, N., Gooding, P., Pratt, D., Kelly, J., Awenat, Y., & Maxwell, J. (2013). *Cognitive behavioural prevention of suicide in psychosis: A treatment manual*. London, UK: Routledge.
- Taylor, P. J., Gooding, P., Wood, A. M., Johnson, J., Pratt, D., & Tarrier, N. (2010). Defeat and entrapment in schizophrenia: The relationship with suicidal ideation and positive psychotic symptoms. *Psychiatry Research*, 178, 244-248.
- Thomas, B. H., Ciliska, D., Dobbins, M., & Micucci, S. (2004). A process for systematically reviewing the literature: providing the research evidence for public health nursing interventions. *World Views on Evidence-Based Nursing*, 1, 176–184.
- Van Orden, K. A., Witte, T. K., Cukrowicz, K. C., Braithwaite, S. R., Selby, E. A., & Joiner, T. E. (2010). The Interpersonal Theory of Suicide. *Psychological Review*, 117(2), 575-600.
- Veale, D., Akyuz, E. U., & Hodsoll, J. (2015). Prevalence of body dysmorphic disorder on a psychiatric inpatient ward and the value of a screening questions. *Psychiatry Research*, 230, 383-386.
- Veale, D. & Bewley, A. (2015). Body dysmorphic disorder. *BMJ*, 350, h2278
- Veale, D., Gournay, K., Dryden, W., Boocock, A., Shah, F., & Willson, R. (1996). Body dysmorphic disorder: A cognitive behavioural model and pilot randomised controlled trial. *Behaviour Research and Therapy*, 34, 717-729.
- Veale, D., & Roberts, A. (2014). Obsessive-compulsive disorder. *BMJ*, 348, g2183.
- Veale, D., Boocock, A., Gournay, K., Dryden, W., Shah, F., Willson, R., & Walburn, J. (1996). Body dysmorphic disorder. *British Journal of Psychiatry*, 169, 196-201.
- Vindigni, V., Pavan, C., Semenzin, M., Granà, S., Gambaro, F., Marini, M., Bassetto, F., & Mazzoleni, F. (2002). The importance of recognizing body dysmorphic disorder in cosmetic surgery patients: Do our patients need a preoperative psychiatric evaluation? *European Journal of Plastic Surgery*, 25, 305- 308.

Weingarden, H., Renshaw, K. D., Wilhelm, S., Tangney, J. P., & DiMauro J. (2016).

Anxiety and shame as risk factors for depression, suicidality, and functional impairment in body dysmorphic disorder and obsessive compulsive disorder.

*Journal of Nervous & Mental Disease.*

Wilhelm, S., Phillips, K. A., Fama, J. M., Greenberg, J. L., & Steketee, G. (2011).

Modular cognitive-behavioral therapy for body dysmorphic disorder. *Behavior Therapy*, 42, 624-633.

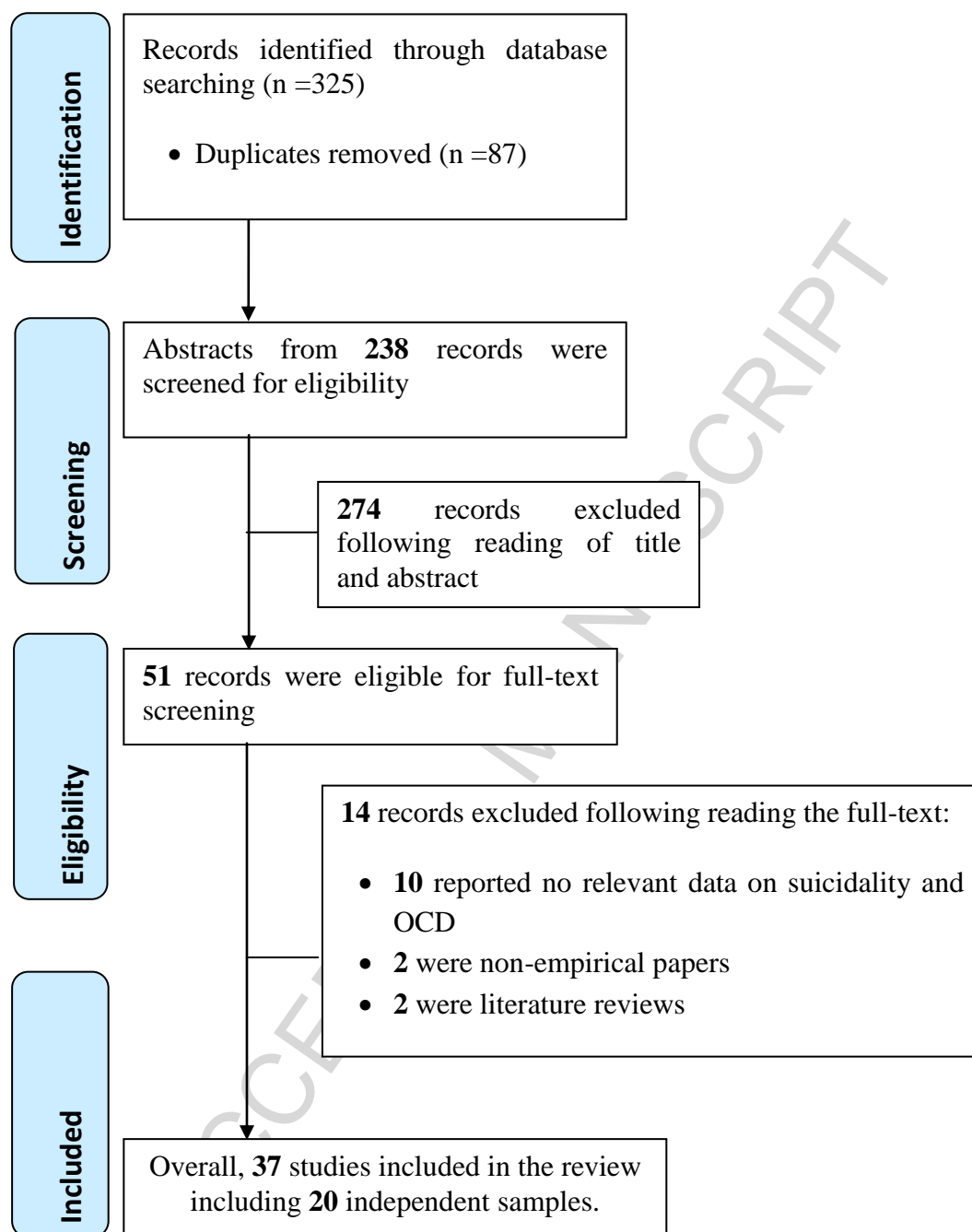
Williams, J. M. G. (1997). *Cry of pain*. Harmondsworth, UK Penguin.

Williams, J. M. G., Crane, C., Barnhofer, T., & Duggan, D. S. (2005). Psychology and suicidal behaviour: Elaborating the entrapment model. In K.Hawton (Ed.), *Prevention and treatment of suicidal behaviour: From science to practice* (pp. 71–89). Oxford: Oxford University Press.

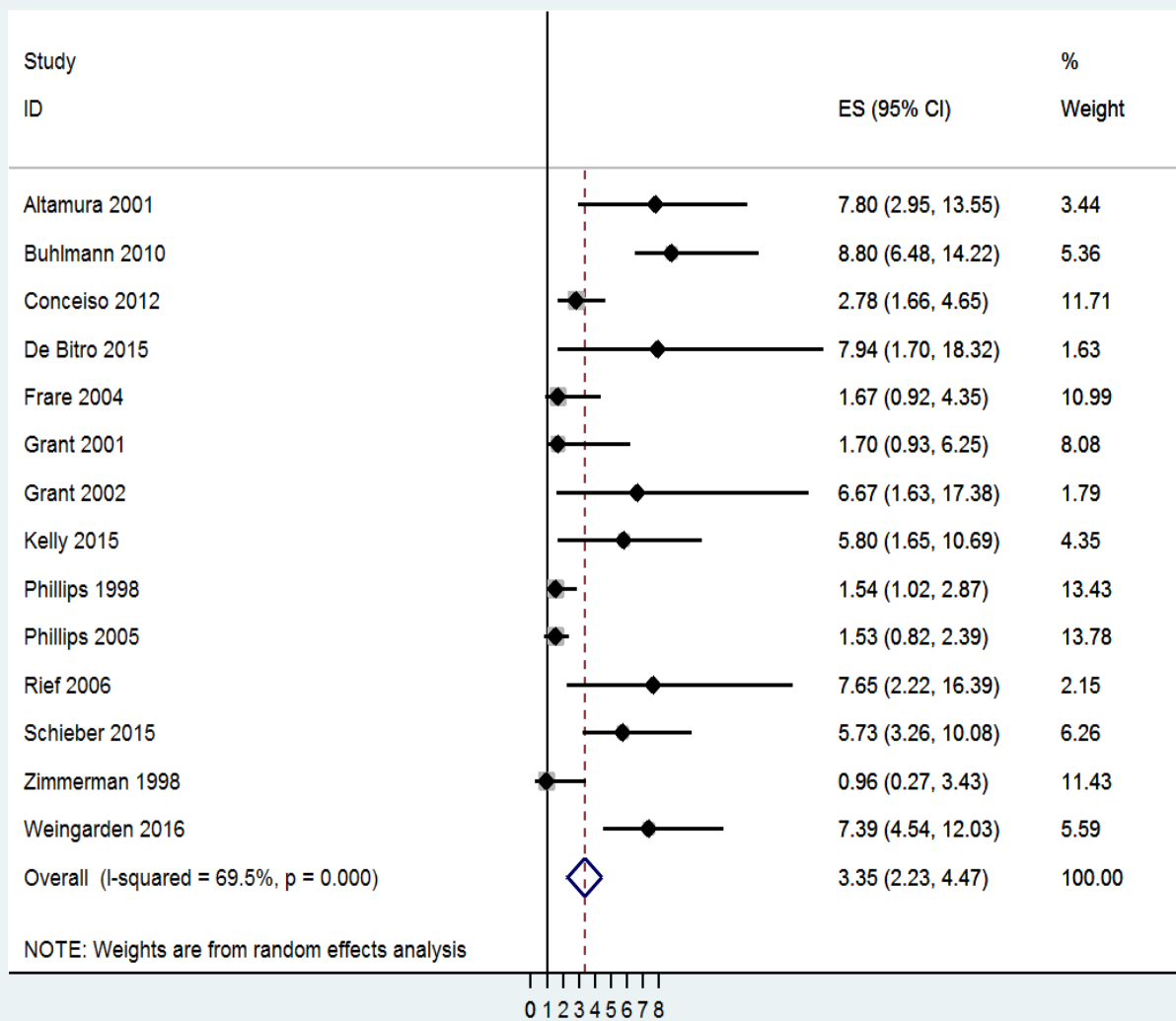
Williams, J., Hadjistavropoulos, T., & Sharpe, D. (2006). A meta-analysis of psychological and pharmacological treatments for body dysmorphic disorder. *Behaviour Research & Therapy*, 44, 99-111.

Witte, T. K., Didie, E. R., Menrad, W., Phillips, K. A. (2012). The relationship between body dysmorphic disorder behaviors and the acquired capability for suicide. *Suicide & Life-Threatening Behavior*, 42, 318-331.

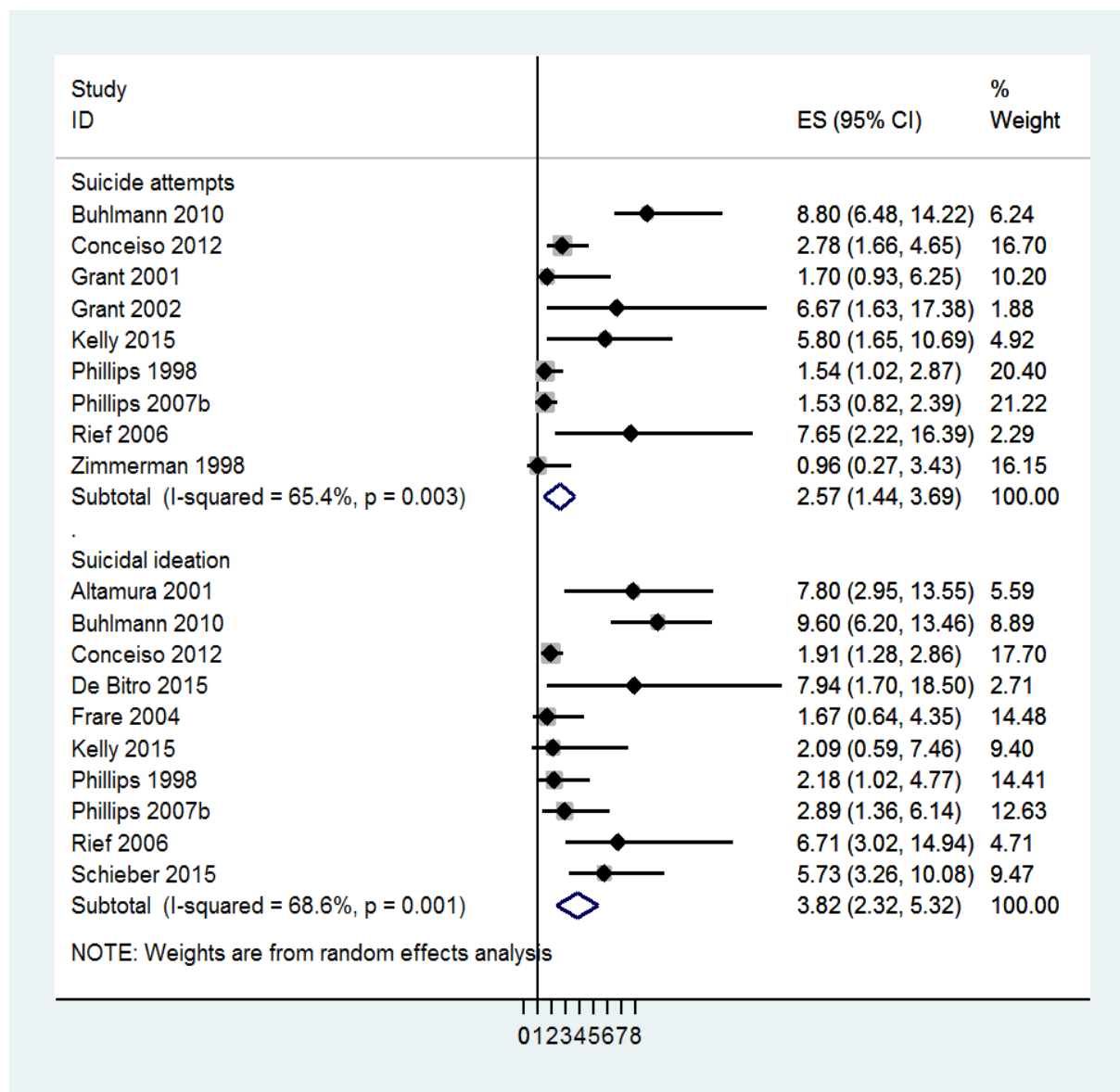
Zimmerman M, & Mattia J. I. (1998). Body dysmorphic disorder in psychiatric outpatients: Recognition, prevalence, comorbidity, demographic, and clinical correlates. *Comprehensive Psychiatry*, 39, 265–270.



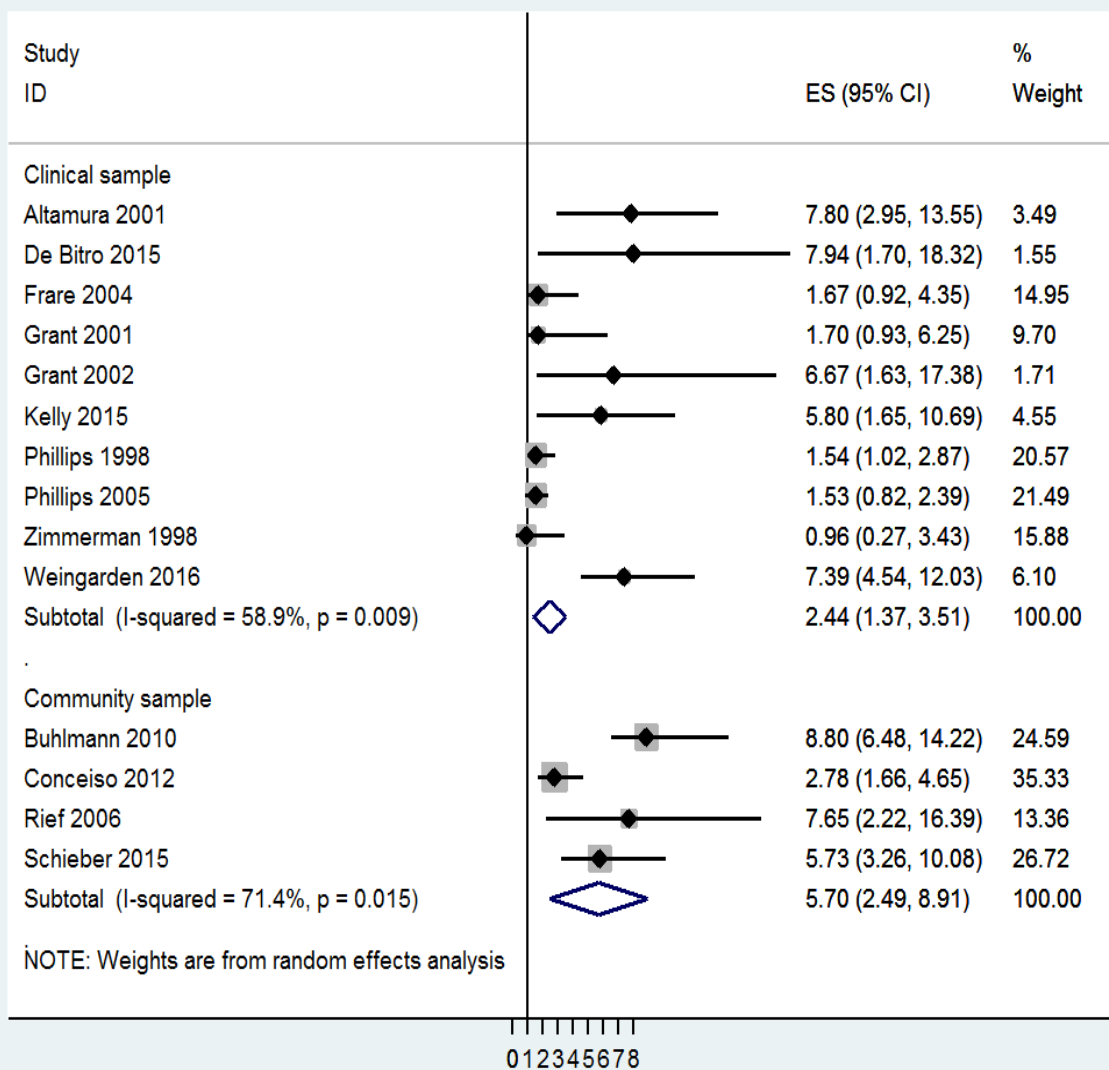
**Fig. 1.** PRISMA 2009 flow diagram for the entire review.



**Fig. 2.** Forest plot of the main analysis of the association between suicidality and BDD. *Note:* Meta- analysis of individual studies and pooled effects. Random effects model used. 95% CI = 95% confidence intervals; ES= Odds ratio.

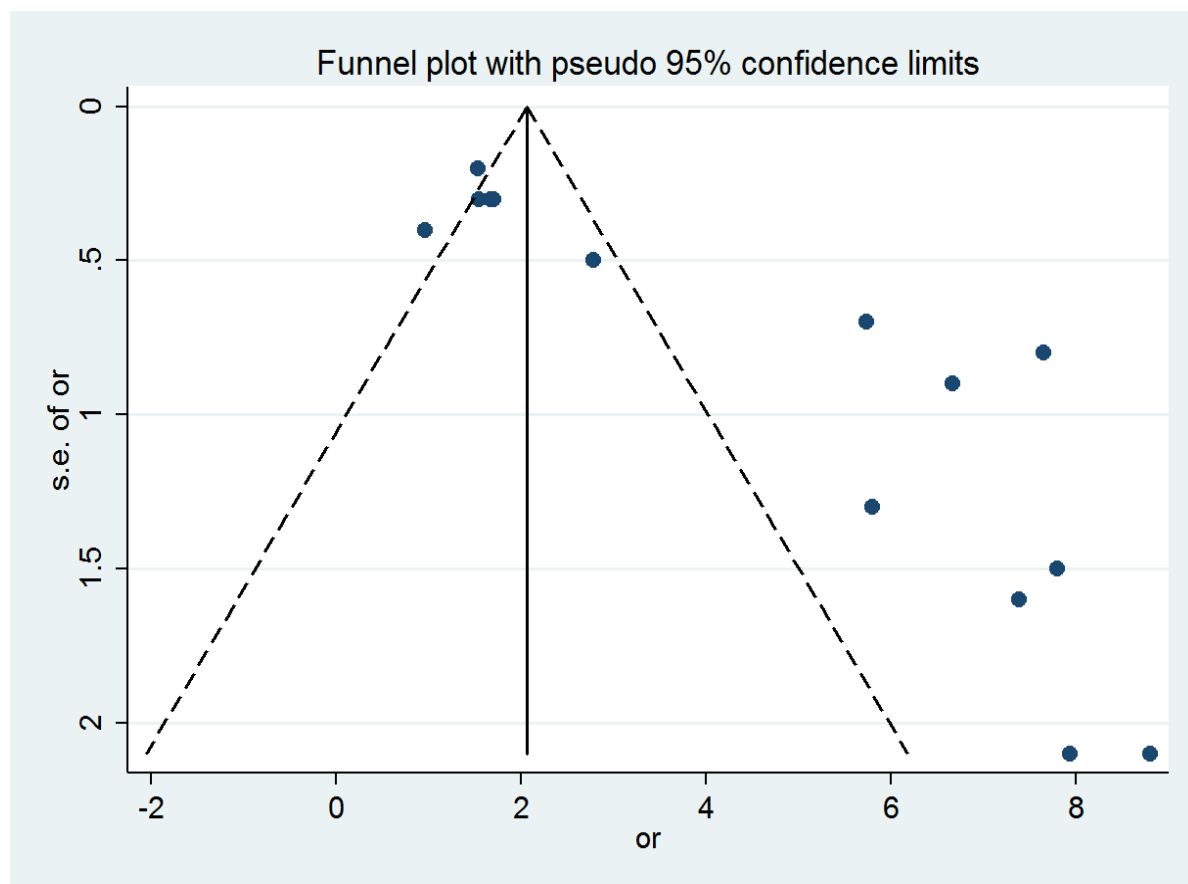


**Fig. 3.** Forest plot of the analysis of the association between different modes of suicidality and BDD. *Note:* Meta- analysis of individual studies and pooled effects. Random effects model used. 95% CI = 95% confidence intervals; ES= Odds ratio.



**Fig. 4.** Forest plot of the subgroup analysis of the association between BDD and suicidality across studies based on clinical populations and community surveys. *Note:* Meta-analysis of individual studies and pooled effects. Random effects model used. 95% CI = 95% confidence intervals; ES= Odds ratio.





**Fig. 5.** Funnel plot for studies examining the link between BDD and suicidality. Publication bias funnel plot showing standard error by the Odds ratios for the 11 studies which examined the association between suicidality and BDD. Egger's regression intercept = -0.58 (SE = 1.78),  $p = 0.312$ .

**Table 1**

Characteristics of the studies included in the review

Study	Country	Study Design	Screening tool for BDD	Screening tool for suicidality	Mode of suicidality	Target population	Sample size <i>N</i>	Mean (%)	Age (years)	Reported rates of Suicidality	Included in meta-analysis
Altamura et al., 2001	Italy	Cross-sectional	A structured interview for DSM-IV (SCID-I) and the Yale-Brown Obsessive - Compulsive Scale adapted for BDD (BDD-Y-BOCS)	A structured interview for DSM-IV (SCID-I)	Suicidal ideation	BDD	478	24.7 %	BDD = 28.5 ( <i>SD</i> = 2.3) sBDD = 25.8 ( <i>SD</i> = 9.0) Control = 34.2 ( <i>SD</i> = 12.7)	+	+
Albertini & Phillips, 1999	USA	Cross-sectional	A semi-structured interview for DSM-IV (SCID-I), the BDD Data Form and the Yale-Brown Obsessive - Compulsive Scale adapted for BDD (BDD-Y-BOCS)	The BDD Form (Unpublished Scale)	Lifetime suicidal ideation & lifetime suicide attempts	BDD	33	9 %	14.9 ( <i>SD</i> = 2.2)	+	-

Bjornson et al., 2013	Iceland	Cross-sectional	The Yale-Brown Obsessive - Compulsive Scale adapted for BDD (BDD-Y-BOCS), the Psychiatric Status Rating Scale for Body Dysmorphic Disorder (BDD-PSR), the Body Dysmorphic Disorder Examination (BDDE)	Suicidal ideation, the Hamilton Rating Scale for Depression	Suicidal ideation due to BDD, attempted suicide, attempted suicide due to BDD	BDD	Sample 1: First diagnosed before 18: 184 (SD = 12.3)	Sample 1: First diagnosed after 18: 33.1 (SD = 9.8)	Sample 2: First diagnosed before 18: 244 (SD = 10.9)	Sample 2: First diagnosed after 18: 46.7 (SD = 8)	+	-
Buhlmann et al., 2010	Germany	Cross-sectional	A questionnaire assessing DSM criteria for current BDD	A questionnaire assessing suicidal ideation - No more information was provided	Suicidal ideation & suicide attempts	BDD	251	45.5 %	46.9 (SD = 18.4)	Range: 14 - 93 years old	+	+

Conceicao et al., 2012	Brazil	Cross-sectional	The presence of BDD was defined in terms of lifetime prevalence using SCID-I/P	The following « yes » or « no » questions were asked: (1) Have you ever thought about killing yourself? (2) Have you ever made suicidal plans? and (3) Have you ever attempted suicide?	Lifetime suicidal ideation, plans and attempts	OCD	901	42,7 %	34.4 ( <i>SD</i> = 12.7)	-	+
Conroy et al., 2008	USA	Cross-sectional	The Body Dysmorphic Disorder Questionnaire (BDD-Q) and a Structured Clinical Interview for DSM-IV	A brief version of the BDD Data Form (Unpublished Scale)	Lifetime suicidal ideation and attempts	BDD	100	31.2 %	BDD: 31.9 ( <i>SD</i> = 11) NoBDD: 40.9 ( <i>SD</i> = 12.5)	+	-

de Brito et al., 2016	Brazil	Cross-sectional	The Body Dysmorphic Disorder Examination and the Clinical Assessment for BDD	n/r	Lifetime suicidal ideation & lifetime suicide attempts	BDD	300	14.67%	Abdominoplasty: 38 ( <i>SD</i> = 11) Rhinoplasty: 34 ( <i>SD</i> = 12) Rhytidectomy: 51 ( <i>SD</i> = 10)	+	+
Dyl et al., 2006	USA	Cross-sectional	The Body Dysmorphic Disorder Questionnaire (BDDQ)	The Suicide Probability Scale (SPS)	Suicidality	BDD, Eating Disorders	208	37.5%	14.8 years ( <i>SD</i> = 1.4)	-	-?
Frare et al., 2004	Italy	Cross-sectional	A semi-structured interview exploring the presence of DSM-III-R diagnostic criteria for BDD	Demographic information based on the Adult Demographic and Personal Inventory (ADPI)	Suicidal ideation	BDD, OCD, BDD/OCD	137	61.9%	26.6 ( <i>SD</i> = 7.4)	+	+
Grant et al., 2001	USA	Cross-sectional	The Body Dysmorphic Disorder Questionnaire (BDD-Q), a brief self-report screening measure	Participants were asked: How many suicide attempts have you made	Suicide attempts	BDD	122	69.54%	38.4 ( <i>SD</i> = 10.1)	+	+

			that screens for BDD, a Semi- structured Clinical Interview for DSM- IV	in your life?							
Grant et al., 2002	USA	Cros- s- secti- onal	The Body Dysmorph- ic Disorder Questionn- aire (BDD- Q), a brief self-report measure that screens for body dysmorph- ic disorder, a Semi- structured Clinical Interview for DSM- IV	Semi- structur- ed diagnos- tic interview (based on the Structu- red Clinical Interview for DSM- IV) to obtain number of suicide attempt- s	Suici- de attem- pts	Anore- xia nervo- sa	41	0 %	26.7 ??( <i>SD</i> = 9.4)	+	+
Kelly et al., 2015	USA	Cros- s- secti- onal	The Body Dysmorph- ic Disorder Questionn- aire (BDD- Q), the Structured Clinical Interview for DSM- IV Axis I Disorders - Patient Edition	n/r	Lifeti- me suicid- al ideati- on & lifeti- me suicid- e attem- pts	BDD	100	88.3 %	49.6 ( <i>SD</i> = 13.7)	+	+

(SCID- P)

Perugi et al., 1997	Italy	Cross-sectional	The Diagnostic Interview for Dysmorphophobia (DID), the Body Dysmorphic Symptom Scale (DSS), the Hopkins Symptom Checklist (HSCL 90)	The Body Dysmorphic Symptoms Scale for suicidal ideation	Suicidal ideation	BDD	58	59 %	25 ( <i>SD</i> = 5.9) Range: 16 - 45	+	-
Phillips et al., 1998	USA	Cross-sectional	SCID-like instrument based on the criteria of DSM-IV for BDD, BDD-Y-BOCS	n/r	Suicidal ideation & suicide attempts	BDD and/or OCD	139	53.2 %	BDD: 32.4 ( <i>SD</i> = 9.2) OCD: 37.5 ( <i>SD</i> = 11.1) OCD/BB D: 33.1 ( <i>SD</i> = 9.8)	+	+
Phillips et al., 2005*	USA	Cross-sectional	The Structured Clinical Interview for DSM-IV Axis I Disorders, Non-Patient Edition	The BDD Form (Unpublished Scale)	Lifetime suicidal ideation, lifetime suicide	BDD	200	31.5 %	32.6 ( <i>SD</i> = 12.1)	+	+

			(SCID-NP), the Yale-Brown Obsessive - Compulsive Scale adapted for BDD (BDD-Y-BOCS)		attempts & completed suicides							
Rief et al., 2006	Germany	Cross-sectional	A questionnaire assessing DSM-criteria for current BDD, a questionnaire assessing clinical characteristics related to BDD symptoms, the Screening for Somatoform Symptoms (state version; SOMS-7)	n/r	Suicidal ideation and suicide attempts due to appearance concerns	BDD	2552	47.9%	47.6 ( <i>SD</i> = 18)	+	+	
Schieber et al., 2015	Germany	Cross-sectional	A questionnaire assessing DSM-criteria for current BDD (based on	An item from the Patient Health Questionnaire (PHQ-9	Suicidal ideation	BDD	2129	46%	45.3 ( <i>SD</i> = 13)	-	+	



			both DSM-IV and DSM- V criteria)									
Veale et al., 1996	UK	Cros- s- secti- onal	The Body Dysmorph- ic Disorder Examinati- on (BDDE), the Yale- Brown Obsessive - Compulsi- ve Scale adapted for BDD (BDD-Y- BOCS)	n/r	Suici- de attem- pts	BDD	50	48 %	32.6 Range: 19 - 58	+	-	
Weing- arden et al., 2016	USA	Cros- s- secti- onal	The Body Dysmorph- ic Disorder Questionn- aire (BDD- Q), the self-report BDD Y- BOCS	Suicide behavio- rs questio- nnaire - revised (SBQ- R)	Suici- dality	BDD, OCD D	361	8%	30.22 (SD = 10.86)	-	+	
Zimm- erman & Mattia , 1998	USA	Cros- s- secti- onal	The Structured Clinical Inter- view for DSM-IV (SCID)	n/r	Lifeti- me suicid- e attem- pts	BDD	500	37.4 %	39.6 (SD = 13.1)	+	+	

*Note.* BDD = Body Dysmorphic Disorder, sBDD = subclinical Body Dysmorphic Disorder,

DSM = Diagnostic and Statistical Manual of Mental Disorders, SCID = Structured Clinical

Interview for DSM disorders, SD = standard deviation, n/r = not reported, + = Yes - = No.

\* This is the primary study from which the majority of data were extracted. However, we also extracted relevant data from additional studies which used the same cohort of participants; details of these studies are included in Appendix 1

ACCEPTED MANUSCRIPT

**Table 2**

Quality appraisal of the studies included in the review.

Study	Study design	Response rates at baseline	Response rates at follow-up	BDD tool reliable	Suicidality tool reliable ?	Confounding factors controlled?	Total quality score
Altamura et al., 2001	0	1	n/a	1	1	0	3
Albertini & Phillips, 1999	0	1	n/a	1	1	0	3
Bjornsson et al., 2013	0	1	n/a	1	1	0	3
Buhlmann et al., 2010	0	1	n/a	1	1	0	3
Conceicao Costa et al., 2012	0	1	n/a	1	1	1	4
Conroy et al., 2008	0	1	n/a	1	1	0	3
de Brito et al., 2016	0	1	n/a	1	0	0	2
Dyl et al., 2006	0	1	n/a	1	1	0	3
Frare et al.,	0	1	n/a	1	1	0	3

2004							
Grant et al.,	0	1	n/a	1	1	0	3
2001							
Kelly et al.,	0	1	n/a	1	0	0	2
2015							
Grant et al.,	0	1	n/a	1	1	0	3
2002							
Perugi et al.,	0	1	n/a	1	1	0	3
1997							
Phillips et	0	1	n/a	1	0	0	2
al., 1998							
Phillips et	0	1	n/a	1	1	0	3
al., 2005							
Rief et al.,	0	0	n/a	1	0	0	1
2006							
Schieber et	0	0	n/a	1	1	0	2
al., 2015							
Veale et al.,	0	1	n/a	1	0	0	2
1996							
Weingarden	0	1	n/a	1	1	0	3
et al., 2016							
Zimmerman	0	1	n/a	1	0	0	2

---

& Mattia,

1998

---

*Note.* n/a = not applicable.

ACCEPTED MANUSCRIPT

## Highlights

- The association between a diagnosis of BDD and suicidality was examined
- The meta-analysis confirmed that suicidality in BDD is an important concern
- BDD is more strongly linked to suicidality than other related illnesses including OCD and Anorexia nervosa
- There is lack of evidence about the psychological mechanisms of suicidality in BDD